APPENDIX-1

PROFORMA FOR SYNOPSIS (Clause 5 of ordinance 45)

1. Title of the thesis	DIVERSITY OF AEROMYCOFLORA OF ACC JAMUL FACTORY AREA AND NON POLLUTED AREA IN JAMUL, BHILAI, DIST DURG (C.G)
2. Introduction(in about 200 words)	- Page number 1
3. A brief review of the work already done in the field	- Page number 2 – 5
4.Objectives	- Page number 6
5. Note worthy contribution in the field of proposed work	- Page number 7 – 8
6. Proposed methodology during the tenure of the research work	- Page number 9 – 10
7. Expected outcome of the proposed work	- Page number 11
8. Bibliography in standard format	- Page number 12 – 14
9. List of published papers of the candidate	-

Signature of the Supervisor

Principal
Govt V.Y.T P G Autonomous
College, Durg (C.G.)

Dr. Deepak Karkun
Principal
Govt.VYT P.G Autonomous College,
Durg (C.G.)

Signature of the Candidate

Seema Verma
Research scholar
(Botany)

Forwarded

Chairman,DRC

Principal
Govt V.Y.T P G Autonomous
College, Durg (C.G.)

Research Centre

Govt.V. Y. T. P.G Autonomous College, Durg (C.G.)

DIVERSITY OF AEROMYCOFLORA OF ACC JAMUL FACTORY AREA AND NON POLLUTED AREA IN JAMUL, BHILAI, DIST DURG (C.G)

INTRODUCTION

The term 'Aerobiology' first used during 1930's as a collective term for studies of aerospora like air borne fungal spores, pollen grains and other microorganisms. Aerobiology is the study of airborne particles that have an impact on humans and other organisms. Every day, we are exposed to airborne particles, such as fungi, pollen, bacteria, and harmful particles,
such as asbestos fibers and noxious chemicals. Aerobiology highlights the current interests primarily the ecology and distribution of airborne particles and their effects on health. Aerobiology is an interdisciplinary branch of science which is closely linked with other disciplines like mycology, microbiology, ecology, meteorology, environmental science and medicines etc. Air is the carrier of the bioparticles that move from one place to another place. Therefore in dissemination of the fungal spores, air is playing an important role. It's also a study sources, dispersion, and effects of airborne biological materials, such as pollen, spores, and other microorganisms. Aero mycological investigations specifically take into account the identification of source, mode of release, dispersal, deposition, impaction and effects of impaction of fungal spores on various living systems.

It is a discipline, which takes in to account the atmosphere transport of the microorganism causing biodeterioration, allergy and disease in animals and plants. Airborne conidia make up the major part of an array of airborne particles that might also include hyphal fragment, pollen grains and small particulate material (Bioaerosole). Airborne fungal spores are well known to cause respiratory allergic diseases particularly bronchial asthma, allergic rhinitis, rhino-conjunctivitis and allergic broncho-pulmonary aspergillosis in both adults and children. The field of aerobiology involves the intersection of a number of fields of study. Aerobiologists want to know the behavior of fungal airborne under the various weather patterns.

In this we study the nature of airborne particles such as pollen, viruses, dust as well as small organisms like, fungi, bacteria and protozoa. Aerobiological research can also be taken place in the field of ecology. Ecologists have studied that how pollen moves through an ecosystem, and the impact of particles produced by human activity on natural environment. Soot, for example, is produced as a byproduct of industrial processes and it can have a profound environmental impact.

A BRIEF REVIEW OF THE WORK ALREADY DONE IN THE FIELD.

Aerobiology has experienced development over 150 years. The aerobiological observations are useful to interpret processes proceeding in biology, meteorology and ecology but also these disciplines are of great help in understanding of aerobiological processes. Fungi are wide spreads all over the world and high environmental burdens have been affected by various factors, such as wind, moisture, and temperature and air pollution on fungi this leads to various changes with respect to fungal species and quantities from one season to another. The concentration of airborne fungal spores has been linked to wind, humidity, temperature rainfall, altitude, vegetation and various contaminations. Fungus growth is found where organic materials are available. Bhati & Gaur (1978) studied on aerobiological fungal spores. It was carried out at modinagar ,situated in the western part of U.P. The site for the study represents a rural and semi industrial area. Several types of spores were found. The seasonal and monthly variation of air borne fungi were studied quantitatively and qualitatively.

Verma and Khare (1987) carried out airspore around Jabalpur university campus. The study resulted in aerobiological investigations carried out with the help of petridishes. The air sampling is done for four consecutive months (from 1st September 83 to 31st December 83). There was a relative decline in spore concentration with the increasing heights. Verma (1989) studied atmospheric biopollutants in rural and urban sites of Jabalpur city. The air borne fungal are of vital interest to allergologists because they cause allergy in human and animals. The sampling was done fortnightly within the vicinity of jabulpur through Rotorod air sampler during the year 1986. Aerspores was reported maximum in winter and mimimum in early summer season. Verma *et al.* (1992) studied volumetric analysis of Air mycoflora of broiler and layer shed. The present aerobiological study was carried out to screen the air mycoflora of a poultry shed which would be helpful in the prevention of mycotic diseases. Burge (2001) studied toxic killers and unavoidable nuisance caused by fungi. The conclusion is primary result from fungal exposure in allergic disease, and that the evidence for inhalation disease resulting from mycotoxin exposure in residential and office settings is extremely weak.

Stepalska *et.al.* (2005) reported variation in fungal spore concentrations of selected taxa associated to weather conditions in Cracow, Poland. The aim of the study was to determine seasonal variation in concentrations of selected fungal spore type due to meteorological parameters. Thirteen taxa of spores were present. Rodriguez Rajo *et al.* (2005) reported variation

assessment of air born *Alternaria* and *Cladosporium* spores at different bioclimatical conditions. The study of mould spores is of major importance as many fungi can cause considerable economic losses worldwide acting as plant pathogens or triggering respiratory diseases and allergenic processes in humans. Oliveira *et al.* (2007) studied the effects of meteorological factors on airborne fungal spore concentration in two areas atmospheric fungal aerosol in Tartu (Estonica). The seasonal distribution of fungal spores was studied continuously (2005–2007) using volumetric spore traps. For the determination the effect of meteorological factors (temperature, relative humidity and rainfall) on spore concentration, the Spearman rank correlation test was used **.** This study can be useful for agriculture, allowing more efficient and reliable application of pesticides, and for human health, by improving the diagnosis and treatment of respiratory allergic disease. Ziska *et al.* (2008) studied climate change, aerobiology and public health in the Northeast United States. The epidemiological implications with respect to climate change and public health (e.g., shifts in disease vectors) are beginning to be acknowledged. Less recognized however, are the potential links between climate, plant biology and public health. The current study give information about impacts of climate/CO2 on plant pollen/fungal spores and associated allergic disease that are, or could be, specific to the Northeast United States.

Das *et al.* (2008) studied enumerating outdoor aeromycota in suburban West Bengal, India with reference to Respiratory Allergy and Meterological factors .the present study investigate aeromycota may act as a reservoir of aeroallergens and upon inhalation may induce IgE-mediated Type I hypersensitivity reaction in pre-sensitized individuals. The total aerospora presented in an agricultural farm in suburban West Bengal was sampled for two years (2002–2004) by a Burkard sampler. Ianovici & Tudorica (2009) studied Aeromycoflora in outdoor Environment of Timisoara city (Romania). An aeromycological study to identify and quantify allergenic fungi and their fluctuations was conducted at Timisoara. The diversity of the aeromycoflora in this study, based on the recovery of fungal propagules by the volumetric sampling method was conducted for 30 days using the Lanzoni sampler.

Ahmed Rao *et al* . (2009) studied airborne fungal flora of Karachi, Pakistan . Investigations of the airborne mycoflora of Karachi was carried out in order to collect different types of airborne fungal spores,In the course of collected spores, different types of fungal spores were identified. The study revealed that the fungal spores were the major components of the air micro flora of the environment of Karachi. These microorganisms were present throughout the year with different

mean values in different seasons. Generally fungi were recorded more in summer than in winter season. Magyar (2009) studied the biodiversity of air spora in an Italian vineyard. In this study the daily concentration of 124 taxa was recorded in an Italian vineyard. Meteorological circumstances affected the biodiversity of fungal flora. It was shown that the best estimator, sun hours, negatively affected the index. The biodiversity of the dominant species was low on dry days, some *species* alone had much higher abundance on such days than other species.

Verma and Pathak (2009) studied a comparative analysis of forecasting methods for Aerobiological studies. Fungal spores are playing an important role in etiology of allergenic disorder. The quantity and quality of airborne spores are largely influenced by environmental factors like temperature, humidity and seasonal variation. Tiwari *et al.* (2010) studied exploring fungal diversity from the surface water of Budhatalab (Pond) Ecosystem of Raipur city, Chhattisgarh, India. The study performed on the isolation and identification of different types of fungi found on the surface water of pond. Total 31 genera and 69 fungal species were found. Sharma and Parveen (2010) reported the occurrence of Mycoflora around Damarea. In this study, the mycoflora near the two different dam of the Dhamtari district of Chhattisgarh state were investigated at weekly intervals from March 2010 to June, 2010. During the present investigation 324 fungal colonies and 17 fungal species were observed. Kabir & Singh (2010) conducted a year round aeromycological study by culture plate technique at Government College Bilaspur. (C.G.) Total 12 different fungal species were obtained which were purified by single colony isolation of Fungal spore were showed time trends during study period. Ghosh *et al*. (2011) reported identification and distribution of Aeromycoflora in the indoor environment of Shyambazar Metro- Railway Station, Kolkata, India. This area of the station is below the ground level and fully surrounded, It is warm and humid with temperature and humidity ranges. In this investigation fourteen spore types were found. The variation in the number of fungal colony was observed after every two weeks, in the summer months. The results of this investigation appeared to be quite significant for taking corrective measures**.** Bhardwaj *et. al* (2011) reported aeromycofloral diversity of St.Thomas college, Bhilai. The study indicates a co-relationship between incidence of fungal biopollutants and the different environmental conditions. Total 32 genera and 27 species were found in different sample sites. Sharma (2011) studied concentration and species diversity of airborne fungi of Dongargarh. During the investigation period they found Environmental factors play an important role for the distribution of the fungal spores. By the help of pouring-plating method. Total 177 fungal colonies represented 18 fungal types were observed during the present investigation period .

Lanjewar (2011) studied estimation of mould air pollution in Tilda, Raipur area . The present study investigated the isolation and identification of airborne fungi from Tilda, Raipur. In this study performed the isolation and identification of airborne fungi from Tilda, Raipur. The sampling procedure for fungi was performed 50 times at the research sites weekly during one year. Total, some 26 mould species belonging to 15 genera were isolated. Nicoleta (2011) studied a comparative aeromycological study of the incidence of allergenic spores in outdoor environment. The study performed only in Urban area of Romania. Spores were identified at the genus level only. Dalal and Bhadange (2011) Diversity of fungal forms of Wardha city. An investigation of the aeromycoflora of Wardha city and to explore the different forms of fungi. A marked variation in aeromycoflora in different areas were also found in different months. Hasnain *et al.* (2012) studied airborne and allergenic fungal spores of Karachi environment and their correlation with meteorological factor. This study was to monitor and analyze airborne fungal flora of the Karachi environment.

OBJECTIVES

The atmosphere of the earth contains many particles of solid matter, a large portion of which is of biological origin. Most viable airborne particles are spores of different organisms which are suited for survival in such an environment. Air is an essential medium for dispersal of inoculums and the microorganisms, inhabiting aerial plant surfaces. Fungal spores predominate the other bio-particles. Fungal spores are potentially allergic to human being and many are pathogenic to agricultural crops.

- .The study intends to survey the fungal spores at ACC (Associate Cement Company) Jamul an industrial town of Dist - Durg, C.G.
- This works report the pattern of incidence of air borne spores, their composition and seasonal variation.
- The aim of the study is to determine seasonal variation in concentrations of selected fungal spore types due to meteorological parameters.
- This research may turn out to identify some unseen (not reported) organisms which are not yet found
- Detection of some economically important, beneficial and harmful microorganisms from both polluted and non polluted area..
- This research helps to investigate the microbial pollution of air of the study area.
- The research aims to perform comparative study of aeromycoflora of the polluted factory area and non polluted area.So as to judge the impact of pollution on aeromycoflora .

- To detect the impact of aeromycofloral spores as allergens with reference to human health.
- The objectives of this study is to identify indicators representing the quantitative and qualitative aspects of fungal resources of the polluted area and non polluted area and its application to assess the present scenario of the resources with a view to its sustainable development.
- The study aims to understand the fungal spectrum present in air of the sampling area
- To study that the fungal spores are the major components of the air micro flora of the environment of ACC Jamul. These microorganisms tends to present throughout the year with different mean values in different seasons.
- This work aims to establish correlations between fungal spore concentrations in ACC Jamul and Non polluted area of Jamul and meteorological data. To determine the effect of meteorological factors (temperature, relative humidity and rainfall) on spore concentration, test required in both locations.

NOTE WORTHY CONTRIBUTION IN THE FIELD OF PROPOSED WORK.

Several researchers have conducted experiments to investigate aeromycoflora of different parts of industrial area, but some major work may be considered noteworthy contribution. The dominant spore and pollen types trapped in the indoor and out door environments of the factory are reportedly allergenic and, consequently, workers are at risk of catching respiratory allergic diseases. Fungal spores are of great interest in aerobiology and allergy due to their high incidence in both outdoor and indoor environments and their widely recognized ability to cause respiratory diseases and other pathologies. Prasad and Inamdar (1990) studied effect of cement kiln dust pollution on black gram *Vigna mungo*.Due to cement klin dust accumulation on plant there was a decrease in height, phytomass ,net primary and cholorophyll content.Quantitative estimations and histo-chemical localization indicate lowering of metabolites in dusted plants as compared to controlled one.

Padmanabhan *et al.* (2004) carried out Airborne fungal spores in a saw mill environment in Palakkad, District Kerala India. Concentration of airborne fungal spores indoor and outdoor environments of a sawmill in Palakkad district of Kerala, India was studied with Burkard Personal Slide Sampler from January to December 1997. Total spore concentration in the indoor and outdoor showed a 3:2 ratio. Higher spore count was observed in indoor in January and in outdoor in October. Thirty three fungal spore types were identified from the indoor and twenty six from the outdoor. *Aspergillus/ Penicillium, Cladosporium, Nigrospora*, *Ganoderma*, `other basidiospores' and ascospores were the dominant components of the airspora.

Aspergillus/Penicillium, the most dominant spore type in the indoor contributed 51.19% and *Cladosporium*, the most dominant spore type in the outdoor contributed 44.75% of the total spores. The study revealed high prevalence of predominantly allergenic fungal spores in the sawmill environment.

Nayar *et al*.(2007) studied Status of airborne spores and pollen in a coir factory in Kerala, India. The fungal spores and pollen grains in the indoor and outdoor environments of a coir factory in Thiruvananthapuram district of Kerala state, India was studied .The concentration of pollen grains was remarkably lower than that of fungal spores (ratio of 1:28). There was no large difference in the concentrations and types of fungal spores between the indoor and outdoor environments.

Dutta *et al.* performed (2009) some observations on the aeromycoflora of Tea Factory in Cachar, District. Assam. A total of 27 fungal species were identified from the air, phyllosphere and soil of the tea plantation area. , out of which a few are known to be mycotoxin producers. The results were compared and correlated with the meteorological conditions of the area.Shukla and Shukla (2010) studied airborne fungal 'spores in the Atmosphere of industrial town Korba, Chhattisgarh, India. The study aimed to understand the fungus present in air ,which is further helpful in disease forecasting and allergic diseases.The study was carried out from march 2007 to February 2008.During the study air samples were taken by Rotorod air sampler using Vaseline coated slide. After sampling slides were mounted with glycerin-Jelly and scanned under microscope. A total of 23 fungal genera were obtained in which *Fusarium* (7.04%), *Alternaria* (6.86%) ,*Rhizopus* (6.7%) and *Aspergillus fumigates* (6.31%) were dominant. Some spores as *Aspergillus, Penicillium, Mucor* etc. are human pathogenic. During the study August 2007 is the month of highest occurrence where ,as March and June 2007 are the months of lowest occurrence.

PROPOSED METHODOLOGY :

PLAN OF WORK

Methodology for the proposed work will constitute following 3 steps.

(1) Survey of Aeromycoflora

i. Survey of the Aeromycoflora of ACC Jamul factory area and non polluted area away from the factory , throughout the year.

ii. Screening and identification of the aeromyoflora throughout the year.

(2) Seasonal Variation

i. Seasonal variation of the Aeromycoflora over Jamul Cement factory area and non polluted area of Jamul .

ii. Monthly variation of the Aeromycoflora over the Jamul factory area and non polluted area of Jamul

(3) Ecological Study

i. Percentage frequency of the Aeromycoflora of Jamul factory area and non polluted area of Jamul.

ii. Percentage contribution of the Aeromycoflora in Jamul factory area and non polluted area of Jamul.

PROPOSED METHODOLOGY

For the survey of Aeromycoflora, 5 Petriplates containing Potato Dextrose Agar (PDA) medium will be exposed for 5-10 min in ACC Jamul factory area and 5 petriplates containing PDA medium will be exposed in non polluted Jamul factory area.

The exposed petriplates will be bring in to the laboratory and incubate at 26±1 °C After incubation period, fungal colonies will be counted, isolated and identify with the help of available literature and finally identified by the authentic authority.

ECOLOGICAL STUDIES

For the Ecological studies, Percentage frequency and Percentage contribution of the aeromycoflora of Jamul factory area and non polluted area will be calculated and the formula to be used is:

% Frequency =*(No. of observations(plates) in which a species appeared / Total no. of observations)* X 100

% Contribution = *Total No. of colonies of a species in all the observations taken together / Total No. of colonies in all the species* X 100

These formula were assessed by Jadhav & Tiwari,(1994) and Shrivastava *et.al.*(2009).

Meteorological Data

The following meteorological data will be recorded from ACC administrative office of the Jamul factory:

- Temperature,
- Relative humidity and
- Rainfall

Expected outcome of the proposed work

Expectation for the present work is as follows:

The effluents of the Jamul factory (Jamul is the eastern region of Durg District Chhattisgarh) may have an effect on the growth of the Mycoflora of this region. Air quality of industrial area has become an important issue , which is partly related to fungal contamination .The distribution and occurrence of Aeromycoflora varies according to location, season of the year, condition of the surrounding area and climatic conditions, i.e. temperature, humidity, rain fall etc. The aim of the study is to gather information about the type of fungal species that are present in the atmosphere of ACC Jamul area and also the information about the contribution of the fungi throughout the year. From the study we can investigate the effects of mycoflora and their allergic disease on human, animals and various fungal disease in plants, inhabiting the area. The study would also try to reveals effects of pollutants of the Jamul factory on the natural fungal diversity.

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Signature of the Supervisor

Principal
Govt V.Y.T P G Autonomous College, Durg (C.G.)

Dr. Deepak Karkun
Principal
Govt.VYT P.G Autonomous College,
Durg (C.G.)

Signature of the Candidate

Seema verma

Research scholar

(Botany)

Forwarded

Chairman,DRC

Principal
Govt V.Y.T P G Autonomous College, Durg (C.G.)

Research Centre

Govt.V.Y.T. P.G Autonomous College, Durg (C.G.)